Lyme Disease Surveillance Report -- Vermont 2011
Vermont Department of Health

This update includes Lyme disease data reported in 2011 to the Vermont Department of Health (VDH). Lyme disease is a nationally notifiable condition and data referenced in this update are based on reports received from physicians and clinical laboratories.

Introduction:

Lyme disease is caused by the bacterial spirochete *Borrelia burgdorferi* and can be transmitted through the bite of an infected deer tick (*Ixodes scapularis)*. The disease was first recognized in 1975 when it was implicated in a mysterious cluster of juvenile rheumatoid arthritis cases in Lyme, Connecticut. Lyme disease is the most commonly reported vector-borne disease in the US, with prevalence rates highest in New England and the Upper Midwest.

Vermont has experienced a significant increase in Lyme disease cases in recent years. The number of confirmed and probable human cases reported to the VDH climbed from 105 cases in 2006 to 623 cases in 2011. Counties in southern Vermont have the highest incidence of Lyme disease, with 2011 rates of greater than 100 cases per 100,000 people in Addison, Rutland, Windham and Windsor counties and greater than 200 cases per 100,000 people in Bennington County.

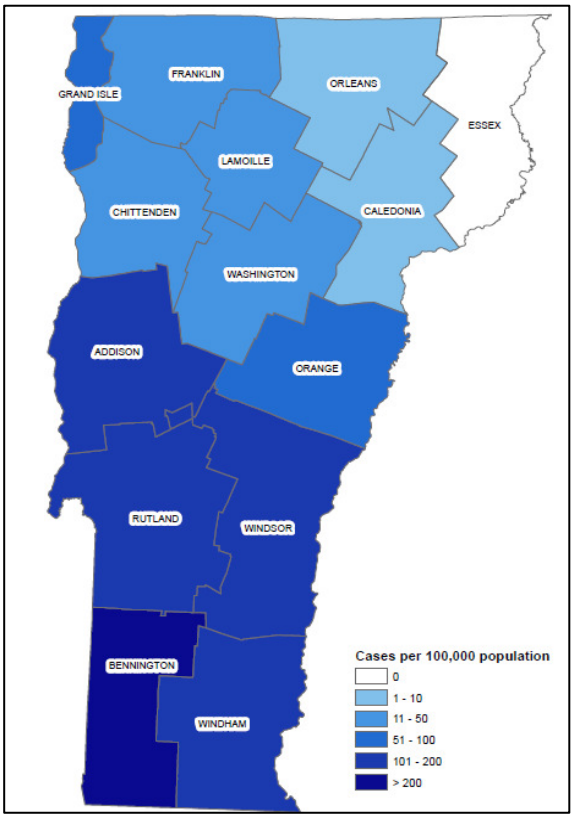


Figure 1: Lyme disease incidence per 100,000 population, Vermont, 2011

	Cases (#)	Percentage (%)
Confirmed	476	46.5
Probable	147	14.3
Suspect	132	12.9
Not a case	268	26.2
Total	**1023**	100

The Vermont Department of Health received 1023 Lyme disease reports from 12 of the 13 counties in the state. Of these reports, 476 (46.5%) met the definition of a confirmed case and 147 (19.5%) met the case definition of a probable case. Case definition is determined based on clinical and laboratory evidence of infection [Appendix A].

Box: 2011 Lyme disease, case summary

- **Incidence Rate:**
  - **76 cases* per 100,000 people**
- **Case Total: 623**
  - **Confirmed: 476**
  - **Probable: 147**
- **Gender:**
  - **Females: 43.3%**
  - **Males: 56.7%**
- **Age:**
  - **Range: 1 - 90 years**
  - **Average: 44 years**
- **Exposure:**
  - **In-State: 512**
  - **Travel Associated: 43**
  - **Unknown: 68**

Limitations for 2011 Lyme disease data

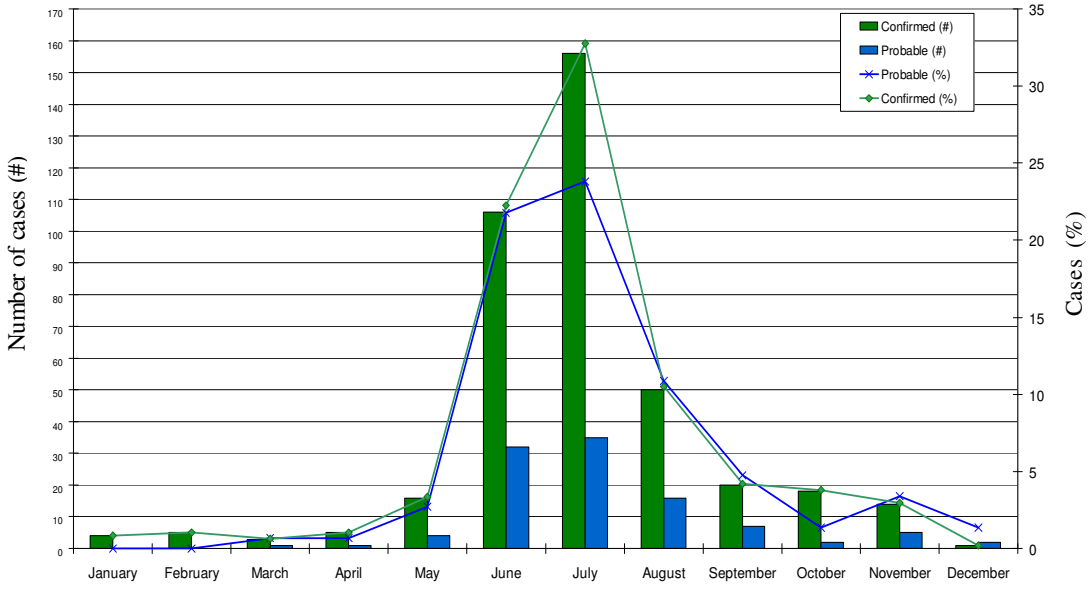
Disease surveillance systems can be inexact because of disease under-reporting and misclassification. Every case of Lyme disease is not reported to the state, and some cases that are reported may be due to another cause. Surveillance data are based on the health department's abilities to capture and classify cases, and may vary between counties and years.

* Confirmed cases of Lyme disease

2011 Lyme disease: Seasonality

Transmission of *Borrelia burgdorferi* is largely dependent upon blacklegged ticks' ability to locate and feed upon competent host animals, which results in a distinct seasonality of infection. Most human cases occur during the peak periods of nymphal host-seeking behavior in late spring and early summer **[Figure 2]**. In 2011, 55% of confirmed cases and 46% of probable cases occurred during June and July.

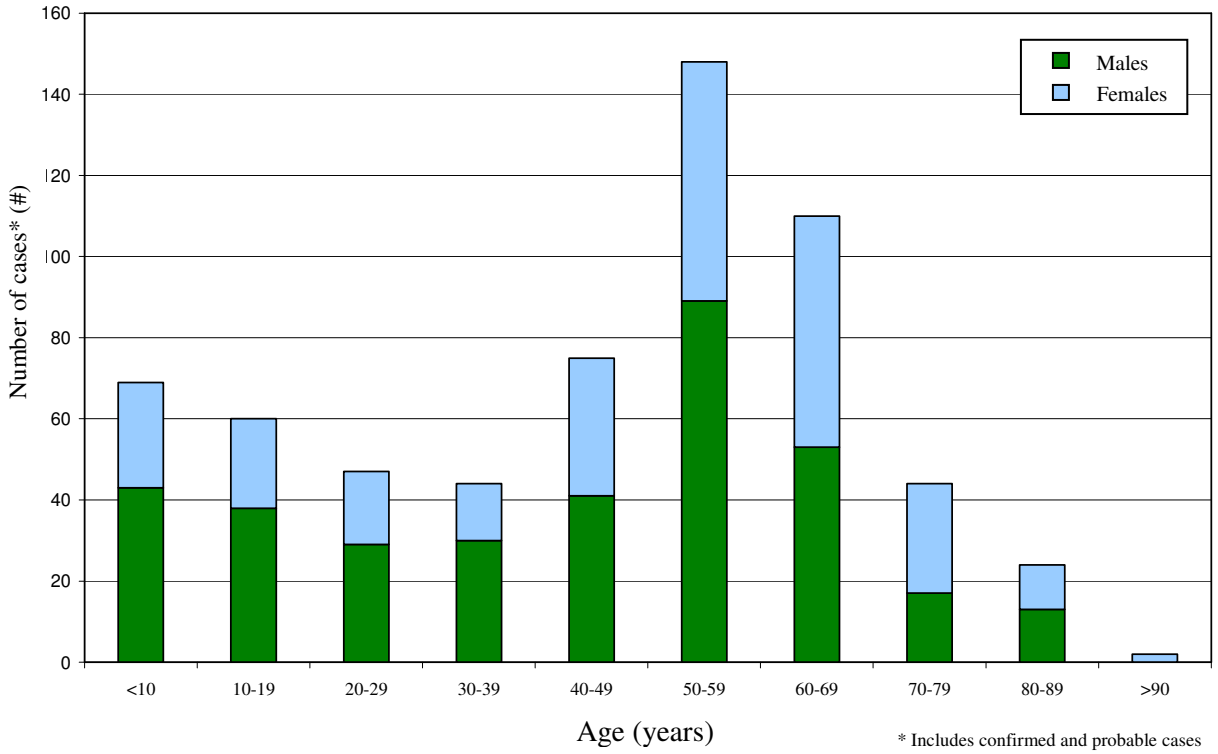
Figure 2: Lyme disease cases, Vermont, 2011



2011 Lyme disease: Cases by age and gender

Lyme disease can affect people of all ages, but it is most commonly diagnosed in children and middle-aged to older adults. In Vermont, 43.3% of reported cases were females and 56.7% of cases were males.

Figure 2: Cases* of Lyme disease by age and gender, Vermont, 2011



2011 Lyme disease: Symptoms

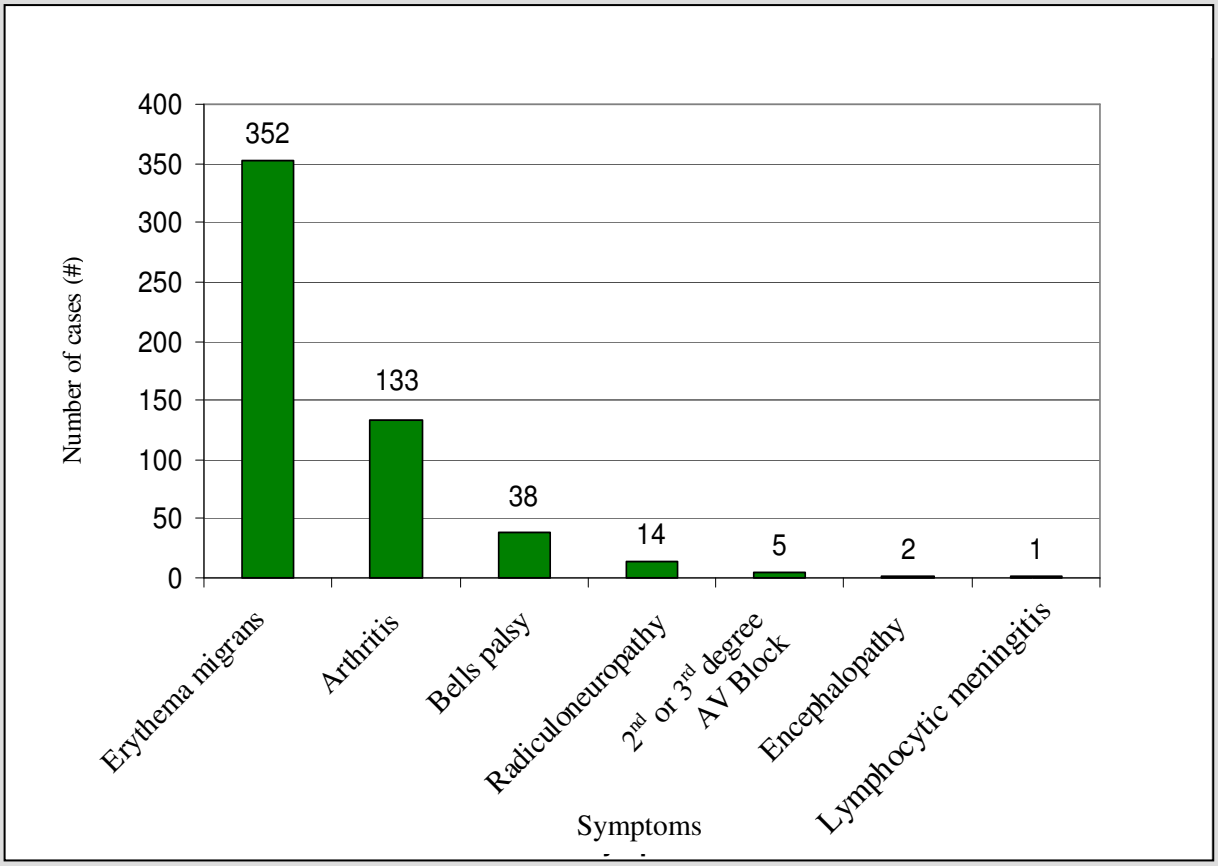
The symptom that is most commonly associated with Lyme disease in the United States is the erythema migrans (EM) rash, which occurs in 60%-80% of people infected with *B. burgdorferi*. In 2011, 74% of all confirmed cases of Lyme disease in Vermont had an EM rash as a major symptom of infection **[Table 1].**

Table 1: Erythemia migrans (EM) presence in confirmed cases, Vermont, 2011

Age	Total cases (#)	EM present (#)	EM present (%)
≤ 18	92	56	61
Adults	384	296	77.1
Total	**476**	**352**	**74.0**

In addition to causing an EM rash, Lyme disease may affect the heart, nerves and musculoskeletal system. The second most common symptom is swelling of the joints (arthritis, 28 %), followed by temporary facial weakness or paralysis (Bells palsy, 8%), and nerve dysfunction (radiculoneuropathy, 2%) **[Figure 3]**.

Figure 3: Lyme disease symptoms in confirmed cases, Vermont, 2011

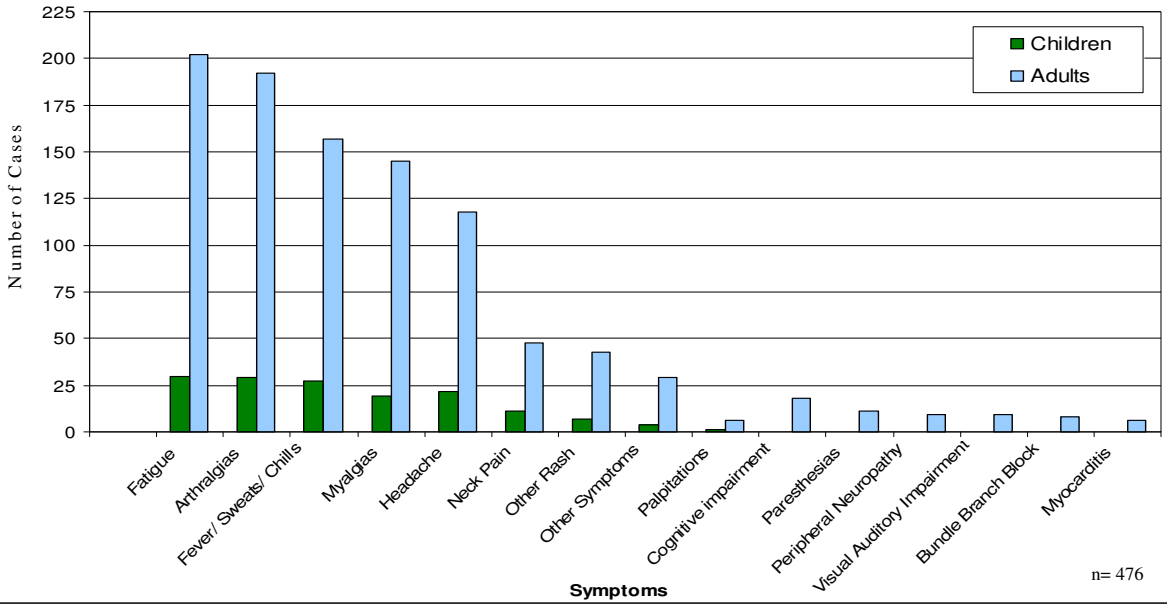


Symptom	Cases (#)	Cases (%)
Erythema migrans	352	74.0
Arthritis	133	28.0
Bells palsy	38	8.0
Radiculoneuropathy	14	2.0
2nd or 3rd degree AV block	5	1
Encephalopathy	2	0.4
Lymphocytic Meningitis	1	0.2

The total percentage of clinical findings among 476 patients for whom at least one symptom was reported amounts to >100% because some patients reported multiple symptoms.

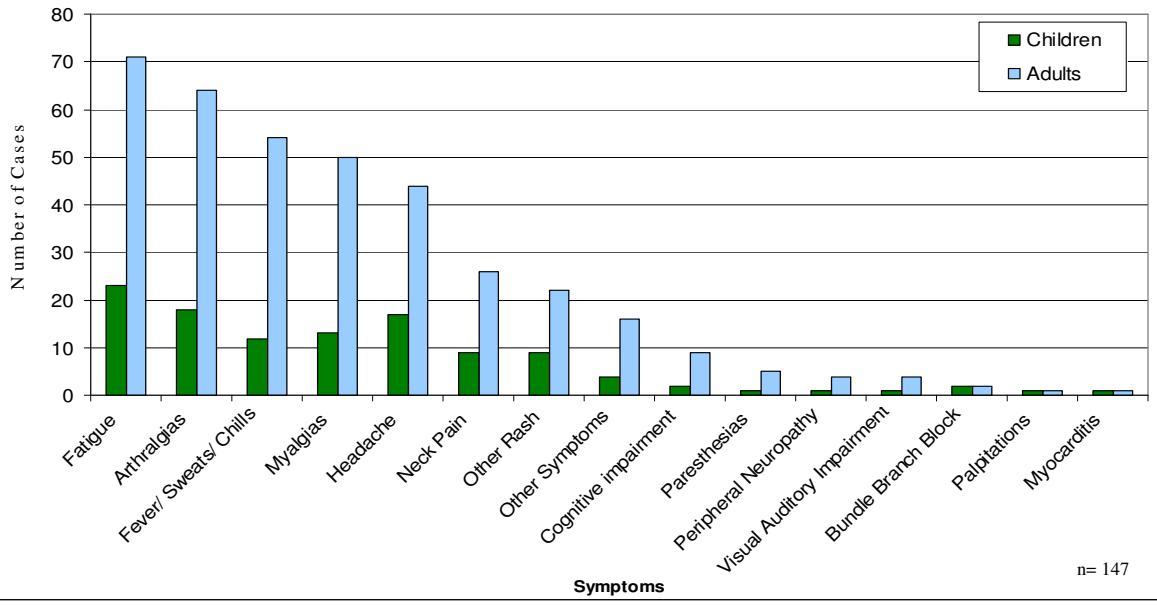
The CDC updated the Lyme disease case definition in 2008 to include 'probable' as a possible case assignment. A 'probable' case is any physician-diagnosed case with clinical symptoms that do not fall into one of the major musculoskeletal, neurologic or cardiac symptom classifications. Symptoms of Lyme disease that are often reported include fatigue, arthralgias, flu-like symptoms and neck pain.

Figure 4: Additional reported symptoms, confirmed cases, Vermont, 2011



Children and adults commonly report additional symptoms of fatigue, joint pain, fever and chills, myalgias, neck pain and headaches.

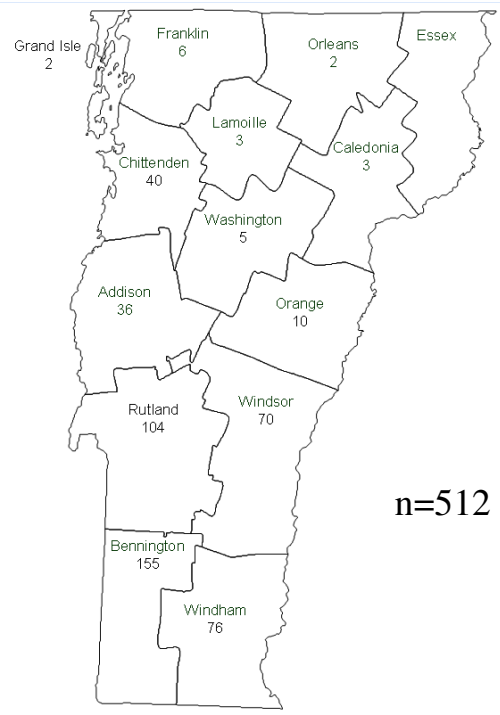
Figure 5: Additional reported symptoms, probable cases, Vermont, 2011



2011 Lyme disease: Incidence, likely in-state exposure, Vermont 2011

The highest incidence of Lyme disease occurs in southern Vermont counties. In 2011 incidence rates were greater than 100 cases per 100,000 people in Rutland, Windham and Windsor counties, and greater than 200 cases per 100,000 people in Bennington County. County data are based on the county of residence of the case.

Figure 6: Lyme disease cases* with likely in-state exposure, Vermont, 2011



County	Cases (#) 2011	Cases (%) 2011
Addison	36	7.03
Bennington	155	30.3
Caledonia	3	0.6
Chittenden	40	7.8
Franklin	6	1
Grand Isle	2	0.4
Lamoille	3	0.6
Orange	10	2.0
Orleans	2	0.4
Rutland	104	20.3
Washington	5	1
Windham	76	15
Windsor	70	14
Grand Total	512	100

* Includes confirmed and probable cases

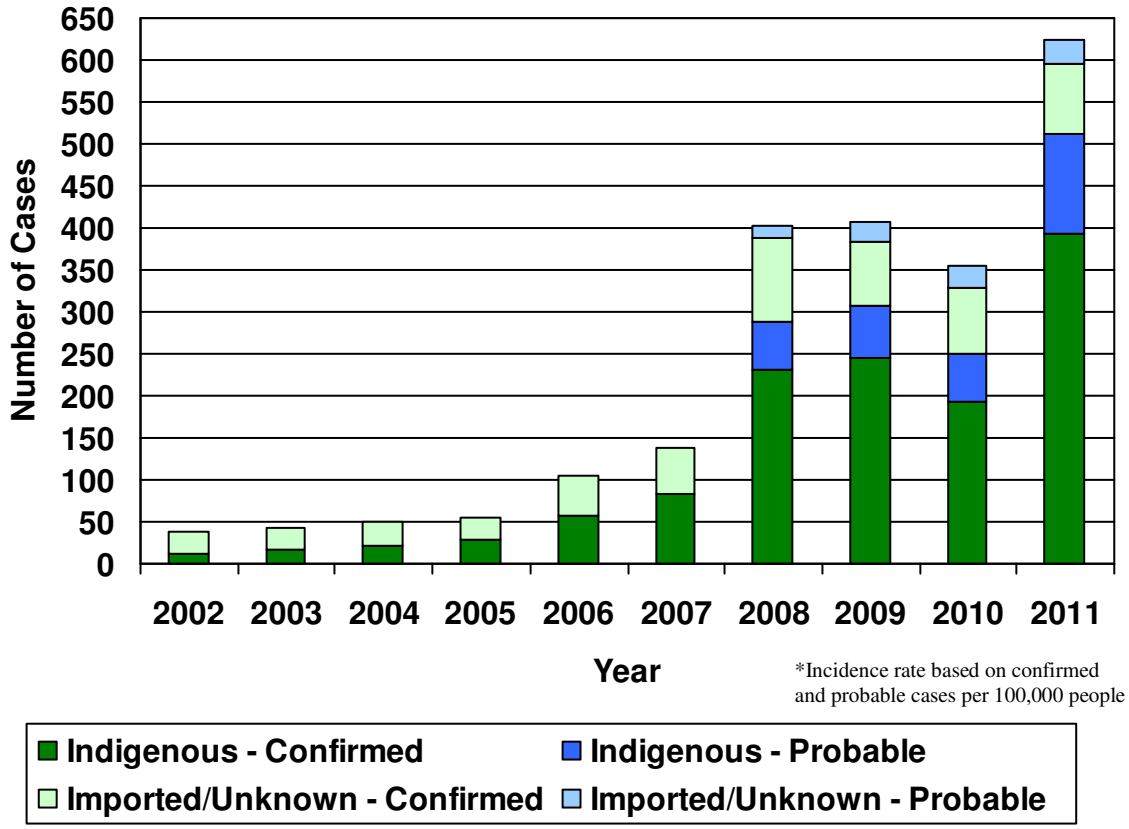
Table 3: Lyme disease case incidence* with likely in-state exposure, Vermont, 2006-2011

County	Cases 2006	Incidence 2006	Cases 2011	Incidence 2011
Addison	3	8	36	98
Bennington	33	90	155	418
Caledonia	0	0	3	10
Chittenden	6	4	40	26
Franklin	0	0	6	13
Grand Isle	1	13	2	29
Lamoille	0	0	3	12
Orange	1	3	10	35
Orleans	0	0	2	7
Rutland	4	6	104	169
Washington	1	2	5	8
Windham	10	23	76	170
Windsor	3	5	70	124
Grand Total	62	16.8	512	81.1

Conclusion:

Evidence shows that the incidence of Lyme disease from exposure to ticks continues to rise in Vermont. An increase in infected tick populations, better recognition and reporting by health care providers, and habitat and environmental changes may account for the high number of cases in the Green Mountain State**.**

Figure 7: Lyme disease cases, Vermont, 2002-2011



The best way to prevent Lyme disease is to prevent tick bites. It is important to take measures to prevent exposure to ticks and reduce the risk of contracting Lyme disease.

- Wear light-colored clothing with a tight weave, so you can spot ticks easily.
- Wear enclosed shoes, long pants and long sleeves. Tuck pant legs into boots or socks and shirt into pants.
- Apply insect repellent containing DEET or permethrin, following label instructions carefully.
- Avoid sitting on the ground or stone walls.
- Do a final, full body tick check at the end of the day, looking for what may seem like nothing more than a new freckle or speck of dirt.
- Shower soon after coming inside from tick habitat.

Learn more about preventing tick bites and protecting yourself, your family & pets against Lyme disease by visiting the Vermont Department of Health website- http://www.healthvermont.gov/prevent/lyme/lyme_disease.aspx

Appendix A:

Lyme Disease 2008 Case Definition: This surveillance case definition was developed for national reporting of Lyme disease; it is not intended to be used in clinical diagnosis.

Clinical presentation:
A systemic, tick-borne disease with manifestations including dermatologic, rheumatologic, neurologic, and cardiac abnormalities. The best clinical marker for the disease is erythema migrans (EM), the initial skin lesion, which occurs in 60%-80% of patients.

For purposes of surveillance, EM is defined as a skin lesion that typically begins as a red macule or papule and expands over a period of days to weeks to form a large round lesion, often with partial central clearing. A single primary lesion must reach greater than or equal to 5 cm in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions occurring within several hours of a tick bite represent hypersensitivity reactions and do not qualify as EM. For most patients, the expanding EM lesion is accompanied by other acute symptoms, particularly fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. These symptoms are typically intermittent. The diagnosis of EM must be made by a physician. Laboratory confirmation is recommended for persons with no known exposure.

For purposes of surveillance, late manifestations include any of the following when an alternate explanation is not found:

- ***Musculoskeletal system.*** Recurrent, brief attacks (weeks or months) of objective joint swelling in one or a few joints, sometimes followed by chronic arthritis in one or a few joints. Manifestations not considered as criteria for diagnosis include chronic progressive arthritis not preceded by brief attacks and chronic symmetrical polyarthritis. Additionally, arthralgia, myalgia, or fibromyalgia syndromes alone are not criteria for musculoskeletal involvement.

- ***Nervous system.*** Any of the following, alone or in combination: lymphocytic meningitis; cranial neuritis, particularly facial palsy (may be bilateral); radiculoneuropathy; or, rarely, encephalomyelitis. Encephalomyelitis must be confirmed by demonstration of antibody production against *Borrelia burgdorferi* in the cerebrospinal fluid (CSF), evidenced by a higher titer of antibody in CSF than in serum. Headache, fatigue, paresthesia, or mildly stiff neck alone, are not criteria for neurologic involvement.

- ***Cardiovascular system***. Acute onset of high-grade (2nd-degree or 3rd-degree) atrioventricular conduction defects that resolve in days to weeks and are sometimes associated with myocarditis. Palpitations, bradycardia, bundle branch block, or myocarditis alone are not criteria for cardiovascular involvement.

Laboratory evidence: For the purposes of surveillance, the definition of a qualified laboratory assay is (1) a positive culture for *B. burgdorferi*, (2) two-tier testing interpreted using established criteria [1], or (3) single-tier IgG immunoblot seropositivity interpreted using established criteria [1-4].

Exposure: Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) in a county in which Lyme disease is endemic. A history of tick bite is not required.

Disease endemic to county: A county in which Lyme disease is endemic is one in which at least two confirmed cases have been acquired in the county or in which established populations of a known tick vector are infected with *B. burgdorferi*.

Case classification:

- ***Confirmed*:** a) a case of EM with a known exposure (as defined above), or b) a case of EM with laboratory evidence of infection (as defined above) and without a known exposure or c) a case with at least one late manifestation that has laboratory evidence of infection.
- ***Probable*:** any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection (as defined above).
- ***Suspected*:** a) a case of EM where there is no known exposure (as defined above) and no laboratory evidence of infection (as defined above), or b) a case with laboratory evidence of infection but no clinical information available (e.g. a laboratory report).
- ***Lyme disease reports will not be considered cases if the medical provider specifically states this is not a case of Lyme disease, or the only symptom listed is "tick bite" or "insect bite."***

References:

1. Centers for Disease Control and Prevention. Recommendations for test performance and interpretation from the Second National Conference on Serologic Diagnosis of Lyme Disease. MMWR MMWR Morb Mortal Wkly Rep 1995; 44:590–1.
2. Dressler F, Whalen JA, Reinhardt BN, Steere AC. Western blotting in the serodiagnosis of Lyme disease. J Infect Dis 1993; 167:392–400.
3. Engstrom SM, Shoop E, Johnson RC. Immunoblot interpretation criteria for serodiagnosis of early Lyme disease. J Clin Microbiol 1995; 33:419–27.
4. Centers for Disease Control and Prevention. Notice to readers: caution regarding testing for Lyme disease. MMWR Morb Mortal Wkly Rep 2005; 54:125–6.
5. Centers for Disease Control and Prevention. Lyme Disease — United States, 2003–2005. MMWR Morb Mortal Wkly Rep 2007; 56:573–6.